Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unsinkable Boat Challenge**

***CHALLENGE:***

Design and build a boat that can hold 25 pennies for at least ten seconds before sinking.

**MATERIALS** (available to purchase (you don’t need them all!)

**Your budget is40**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ITEM** | **Price per Unit** | **Units purchased** | **Cost to you** |  |
| Twist tie | 2 per tie |  |  |  |
| Plastic wrap | 1 per inch |  |  |  |
| Straw | .50 per straw |  |  |  |
| Duct tape | 1 per inch |  |  |  |
| Paper cup | 5 per cup |  |  |  |
| Rubberband | 2 per band |  |  |  |
| scissors | .50 per class period |  |  |  |
| Bin of water | 2 per class period |  |  |  |
| 25 pennies | .50 per class period |  |  |  |
| Construction paper | 2 per ½ sheet |  |  |  |
|  |  |  | **Total:** |  |

**BRAINSTORM & DESIGN:**

Look at the materials available and think about the questions below. Discuss the questions with your group members. Record your ideas, then *sketch your ideas* for a boat design on a piece of graph paper. You will not be allowed to purchase your materials until AFTER your sketch is initialed by the teacher.

1. How will you make a boat that floats well enough to support a heavy load without sinking?
2. Should your boat be a platform (e.g., a raft or barge) or an open boat (e.g., a rowboat or canoe)?
3. What’s the best way to make your boat waterproof?
4. How big do you need to make your boat to hold 25 pennies?

**BUILD, TEST, EVALUATE & REDESIGN:**

1. Purchase and use the materials to build your boat.
2. Then test it by floating it in a container of water and adding pennies, one at a time. (Remember, you will need to purchase the water/ pennies to conduct a test!)
3. When you test, your design may not work as planned. When engineers solve a problem, they try different ideas, learn from mistakes, and try again. The steps they use to arrive at a solution is called the ***design process.*** Study the problems and then redesign. For example, if the boat:
   1. sinks easily—Increase *its ability to float. When you set your boat in water, notice how it sinks down a bit, pushing aside some water. The water pushes right back, pressing on the boat’s bottom and sides. The force from these pushes is called* ***buoyancy.*** *To change your boat’s buoyancy, experiment with the boat’s width and the height of its sides.*
   2. leaks a lot—See *if the straws are filling with water or if the plastic wrap is separating.*
   3. *ti*ps easily—Check *how near the weights are to each other. A boat can get tippy when one part is heavier than another.*

Once you have successfully completed the challenge. **Place your boat on display for all teams to see,** then answer the reflection questions.

**Reflection questions- Each person must answer individually using complete sentences :**

1. What are some things that all the boats have in common?
2. Which held more pennies, a platform raft or a boat built over a frame? Explain why you think this.

1. How did knowing about buoyancy influence the design of your boat?
2. What was the toughest part of this challenge?
3. What did you learn from doing this challenge?